10-631991

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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Cancelled).

2. (Cancelled).

3. (Previously Presented) The method of claim 12, wherein:
the Monte Carlo samples comprise stochastic Monte Carlo samples.

4. (Previously Presented) The method of claim 12, wherein:
the probability distribution of the symbols is represented by $p(\mathbf{s} \mid \mathbf{z})$, where $\mathbf{s}$ is a vector of transmitted signal values for different transmit antennas in a symbol interval, and $\mathbf{z}$ is a vector of received signals from the different transmit antennas after nulling.

5. (Previously Presented) The method of claim 12, wherein determining the set of Monte Carlo samples of the symbols in a symbol interval, represented by $\{(s_k^{(j)}, w_k^{(j)})\}$, comprises:

determining a trial sampling density for each ith value, a_i, in an alphabet set A from which the symbols take their values, using the *a priori* probability value $P(s_k=a_i)$ from a previous iteration, where the symbols are represented by s_k, and k is an index identifying a transmit antenna;

drawing the jth sample symbol $s_k^{(j)}$, from the alphabet set A, where $j=1,2,\ldots,m$, and m is a number of the Monte Carlo samples determined for the symbol interval; and

computing an importance weight $w_k^{(j)}$ for $s_k^{(j)}$.

6. (Original) The method of claim 5, further comprising:
performing resampling to obtain updated importance weights $w_k^{(j)}$.

7. (Original) The method of claim 5, further comprising:
initializing the importance weights $w_{-1}(j)=1$.

8. (Previously Presented) The method of claim 12, wherein:
m is a number of the Monte Carlo samples determined for a symbol interval;
the Monte Carlo samples are represented by $\{(s_k^{(j)}, w_k^{(j)})\}$,
each *a posteriori* probability value $P(s_k=a_i \mid \mathbf{z})$ is obtained from

$$P(s_k=a_i \mid \mathbf{z})=\frac{1}{W_k}\sum_{j=1}^{m}1(s_k^{(j)}=a_i)w_k^{(j)}, a_i\in A \text{ where}$$

z is a vector of received signals from different transmit antennas after nulling;

the symbols are represented by s_k, where k is an index identifying a transmit antenna;

importance weights for the symbols s_k are represented by w_k;

A is an alphabet set from which the symbols take their values, and a_i is an ith value in A;

$W_k \triangleq \sum_{j=1}^{m} w_k^{(j)}$; and

1 is an indicator function defined by $1(x=a)=\begin{cases}1, & \text{if } x=a,\\ 0, & \text{if } x\neq a.\end{cases}$

9. (Previously Presented) The method of claim 12, further comprising:
based on the *a posteriori* probability values, calculating *a posteriori* log-likelihood ratios of interleaved code bits.

10. (Previously Presented) The method of claim 12, wherein:
the Monte Carlo samples comprise deterministic Monte Carlo samples.

11. (Previously Presented) The method of claim 12, wherein determining the set of Monte Carlo samples of the symbols in a symbol interval, represented by $\{(s_k^{(j)}, w_k^{(j)})\}$, comprises:

calculating an exact expression for the probability distribution by enumerating m samples for less than all transmit antennas to obtain m data sequences, where m is a number of the Monte Carlo samples determined for the symbol interval;

computing the importance weight $w_k^{(j)}$ for each symbol $s_k^{(j)}$, where k is an index identifying a transmit antenna; and

selecting and preserving m distinct data sequences with the highest weights.

12. (Currently Amended) A method for demodulating data from a multiple-input multiple-output (MIMO) channel, comprising:

receiving *a priori* probability values for symbols transmitted across the MIMO channel, said *a priori* probability values are represented by $P(s_k=a_i)$, where the symbols in a symbol interval are represented by s_k, and k is an index identifying a transmit antenna; and a_i is an ith value in an alphabet set from which the symbols take their values;

in accordance with the *a priori* probability values, determining a set of Monte Carlo samples of the symbols weighted with respect to a probability distribution of the symbols; and

estimating *a posteriori* probability values for the symbols based on the set of Monte Carlo samples.

13. (Currently Amended) A program storage device tangibly embodying a program of instructions executable by a machine to perform a method for demodulating data from a multiple-input multiple-output (MIMO) channel, the method comprising:

receiving *a priori* probability values for symbols transmitted across the MIMO channel, said *a priori* probability values being represented by $P(s_k=a_i)$, where the symbols in a symbol interval are represented by s_k, and k is an index identifying a transmit antenna; and a_i is an ith value in an alphabet set from which the symbols take their values;

in accordance with the *a priori* probability values, determining a set of Monte Carlo samples of the symbols weighted with respect to a probability distribution of the symbols; and

estimating *a posteriori* probability values for the symbols based on the set of Monte Carlo samples.

14. (Cancelled)

15. (Previously Presented) The demodulator of claim 17, wherein: the Monte Carlo samples comprise stochastic Monte Carlo samples.

16. (Previously Presented) The demodulator of claim 17, wherein: the Monte Carlo samples comprise deterministic Monte Carlo samples.

17. (Currently Amended) A demodulator for demodulating data from a multiple-input multiple-output (MIMO) channel, comprising:

means for receiving *a priori* probability values for symbols transmitted across the MIMO channel, said *a priori* probability values being represented by $P(s_k=a_i)$, where the symbols in a symbol interval are represented by s_k, and k is an index identifying a transmit antenna; and a_i is an ith value in an alphabet set from which the symbols take their values;

means for determining, in accordance with the *a priori* probability values, a set of Monte Carlo samples of the symbols weighted with respect to a probability distribution of the symbols; and

means for estimating *a posteriori* probability values for the symbols based on the set of Monte Carlo samples.

18. (Cancelled)

19. (Cancelled).

20. (Cancelled).

21. (Previously Presented) A method for demodulating data from a channel, the channel comprising a multiple-input multiple-output (MIMO) channel, the method comprising:

(a) receiving *a priori* probability values for symbols transmitted across the channel;

(b) in accordance with the *a priori* probability values, determining a set of deterministic Monte Carlo samples of the symbols in a symbol interval, represented by $\{(s_k^{(j)}, w_k^{(j)})\}$, weighted with respect to a probability distribution of the symbols, by:

(b1) calculating an exact expression for the probability distribution by enumerating m samples for less than all transmit antennas to obtain m data sequences, where m is a number of the deterministic Monte Carlo samples determined for the symbol interval;

(b2) computing the importance weight $w_k^{(j)}$ for each symbol $s_k^{(j)}$, where k is an index identifying a transmit antenna; and

(b3) selecting and preserving m distinct data sequences with the highest weights; and

(c) estimating *a posteriori* probability values for the symbols based on the set of deterministic Monte Carlo samples; wherein:

(d) the probability distribution of the symbols is represented by $p(\mathbf{s} \mid \mathbf{z})$, where **s** is a vector of transmitted signal values for different transmit antennas in a symbol interval, and **z** is a vector of received signals from the different transmit antennas after nulling.

22. (Previously Presented) A method for demodulating data from a channel, the channel comprising a multiple-input multiple-output (MIMO) channel, the method comprising:

(a) receiving *a priori* probability values for symbols transmitted across the channel;

(b) in accordance with the *a priori* probability values, determining a set of deterministic Monte Carlo samples of the symbols in a symbol interval, represented by $\{(s_k^{(j)}, w_k^{(j)})\}$, weighted with respect to a probability distribution of the symbols, by:

(b1) calculating an exact expression for the probability distribution by enumerating m samples for less than all transmit antennas to obtain m data sequences, where m is a number of the deterministic Monte Carlo samples determined for the symbol interval;

(b2) computing the importance weight $w_k^{(j)}$ for each symbol $s_k^{(j)}$, where k is an index identifying a transmit antenna; and

(b3) selecting and preserving m distinct data sequences with the highest weights;

(c) estimating *a posteriori* probability values for the symbols based on the set of deterministic Monte Carlo samples; wherein:

(d) wherein the probability distribution of the symbols is represented by p(**s** | **z**), where **s** is a vector of transmitted signal values for different transmit antennas in a symbol interval, and **z** is a vector of received signals from the different transmit antennas after nulling;

(e) wherein m is a number of the deterministic Monte Carlo samples determined for a symbol interval;

each *a posteriori* probability value $P(s_k=a_i \mid \mathbf{z})$ is obtained from

$$P(s_k=a_i \mid \mathbf{z})=\frac{1}{W_k}\sum_{j=1}^{m}1(s_k^{(j)}=a_i)\,w_k^{(j)},\quad a_i \in A \text{ where}$$

z is a vector of received signals from different transmit antennas after nulling;

A is an alphabet set from which the symbols take their values, and a_i is an ith value in A;

$W_k \triangleq \sum_{j=1}^{m} w_k^{(j)}$; and

1 is an indicator function defined by $1(x=a)=\begin{cases}1, & \text{if } x=a,\\ 0, & \text{if } x\neq a.\end{cases}$

and

(f) calculating, based on the *a posteriori* probability values, *a posteriori* log-likelihood ratios of interleaved code bits.